

Section 1

1. a. 1, 2, 3, 4, 5
b. $-1, \frac{1}{2}, \frac{-1}{3}, \frac{1}{4}, \frac{-1}{5}$
c. $1, \sqrt{2}, \sqrt[3]{3}, \sqrt[4]{4}, \sqrt[5]{5}$
d. $\ln(\ln 2), \ln(\ln 3), \ln(\ln 4), \ln(\ln 5), \ln(\ln 6)$
e. $\frac{1}{4}, \frac{3}{16}, \frac{9}{64}, \frac{27}{256}, \frac{81}{1024}$
3. 1b; converges to 0
1c; converges to 1
1e; converges to 0
2b; converges to 0
5. a. $s_5 = \frac{163}{60}; s_{10} \approx 2.7182818$
The series converges to e .
b. $s_5 = \frac{11}{30}; s_{10} \approx 0.367879$
The series converges to $1/e$.
7. Diverges; geometric with $r = -2$
9. Diverges; fails n^{th} term test ($\lim a_n = 1$)
11. Converges; geometric with $r = \frac{e}{\pi} < 1$
13. Diverges; fails n^{th} term test ($\lim a_n$ DNE)
15. Hard to say at this point (Later we will be able to prove that this series diverges.)
17. $\frac{2}{1 - \frac{1}{8}} = \frac{16}{7}$
19. $\frac{4}{1 - \frac{4}{5}} = 20$
21. $\frac{(\frac{3}{4})^{10}}{1 - \frac{3}{4}} = \frac{59049}{262144}$
23. $\frac{5}{1 - \frac{1}{4}} + \frac{1}{1 - \frac{3}{4}} = \frac{32}{3}$
27. Down: $\sum_{n=0}^{\infty} 1 \cdot \left(\frac{1}{3}\right)^n = \frac{3}{2}$

$$\text{Up: } \sum_{n=1}^{\infty} 1 \cdot \left(\frac{1}{3}\right)^n = \frac{1}{2}$$

Total: 2 meters

$$29. \sum_{n=0}^4 7^n = 2801$$

$$31. 2$$

$$33. a. s_n = 1 - \frac{1}{n+1}$$

$$b. 1$$

$$35. 1$$

$$37. \frac{\pi}{2}$$

$$39. \text{False}$$

$$41. \text{False}$$

$$43. \text{False}$$

$$45. a. P_n = 3 \cdot \left(\frac{4}{3}\right)^n; \text{diverges}$$

$$b. A = \frac{\sqrt{3}}{4} + \sum_{n=1}^{\infty} 3 \cdot 4^{n-1} \cdot \frac{\sqrt{3}}{4} \left(\frac{1}{9}\right)^n = \frac{2\sqrt{3}}{5}$$

Section 2

$$1. P_5(x) = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5$$

$$3. P_5(x) = 1 - x + x^2 - x^3 + x^4 - x^5$$

$$5. a. \frac{1}{1+x^2} \approx 1 - x^2 + x^4 - x^6$$

$$b. \arctan(x) \approx x - \frac{1}{3}x^3 + \frac{1}{5}x^5$$

$$d. \arctan(0.2) \approx 0.1974 \text{ (very close)}$$

$$\arctan(-0.6) \approx -0.5436 \text{ (pretty close)}$$

$$\arctan(3) \approx 42.6 \text{ (absolutely terrible)}$$

$$7. a. P_3(x) = \frac{5}{2} + \frac{5}{4}x + \frac{5}{8}x^2 + \frac{5}{16}x^3$$

$$b. P_3(x) = 3 - 3x^2$$

$$c. P_3(x) = 2x - 2x^3$$

$$d. P_3(x) = \frac{1}{2}x + \frac{1}{4}x^2 + \frac{1}{8}x^3$$